L^2 *ISFA Lyon et DSA-HEC Lausanne*

61ᵉ Journées de séminaires actuariels

à l'Unil

Salle Extranef 109

Lundi 8 février 2016

- **12 h 00**

  Repas au restaurant de Dorigny, Université de Lausanne

- **14 h 00**

  Héloïse Labit-Hardy, DSA, Université de Lausanne

  « Cause-of-Death Mortality and Population Dynamics: Socio-economic differentials »

- **14 h 30**

  Frédéric Planchet, ISFA, Université Lyon 1

  « Choosing a nonparametric estimator for the construction of experience tables in insurance »

- **15 h 00**

  Philipp Müller, DSA, Université de Lausanne

  « The Impact of pension funding mechanisms on the stability and the payoff from DC pension schemes »

- **15 h 30**

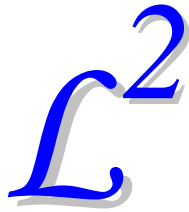 Stéphane Loisel, ISFA, Université Lyon 1

  « Two years with LoLitA: achievements and challenges »

- **16 h 00**

  Discussions informelles

- **19 h 30**

  Repas au Café Java, rue Marterey 36, 1005 Lausanne

ISFA Lyon et DSA-HEC Lausanne

Mardi 9 février 2016

> **9 h 00**

Maissa Tamraz, DSA, Université de Lausanne

« Collective models for the largest claims of multivariate portfolios »

> **9 h 30**

Mabelle Sayah, ISFA, Université Lyon 1

« Analyzing and Comparing Basel's III Sensitivity Based Approach for the interest rate risk in the trading book »

> **10 h 00**

Youssouf Toukourou, DSA, Université de Lausanne

« On bivariate lifetime modelling in life insurance applications »

> **10 h 30**

Pause-café

> **11 h 00**

Hanspeter Schmidli, Université de Cologne, Allemagne

« Capital Injections and Dividends with Tax »

> **12 h 00**

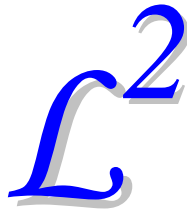Repas au restaurant de Dorigny, Université de Lausanne

> **14 h 00**

Guillaume Biessy, SCOR Global Life & Laboratoire de Mathématiques et Modélisation d'Évry - Université d'Évry Val d'Essonne, France

« Continuous time semi-Markov inférence of biometric laws associated with a Long-Term Care Insurance portfolio »

> **15 h 00**

Anani A. Olympio, ISFA, Université Lyon 1

« Title TBA »

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ISFA Lyon et DSA-HEC Lausanne

Lundi 8 février 2016

Speaker: Héloïse Labit-Hardy, DSA, Université de Lausanne

Title: « Cause-of-Death Mortality and Population Dynamics: Socio-economic differentials »

Abstract: Two major risks life insurance companies have to face are the mortality and longevity risks. The exposure to these risks for the company depends on the profile of its insured portfolio. Indeed, age, gender and socio-economic category are risk factors for mortality, and thus for mortality by cause of death. For this project, we are interested in studying the cause-of-death mortality for an insurance portfolio. As causes of death are not equally represented among different subpopulations, we are trying to assess the impact on the dynamics of an insurance portfolio of a cause-of-death mortality reduction. For that purpose, we study the portfolio evolution with a population dynamics model, including arrivals of new individuals with their own characteristics. We apply this model to a case study with English data on cause-of-death mortality by age, gender and socio-economic category. To go further, we extend this problematic to a heterogeneous population by taking into account birth patterns.

Speaker: Frédéric Planchet, ISFA, Université Lyon 1

Title: « Choosing a nonparametric estimator for the construction of experience tables in insurance »

Abstract: In many practical applications, actuaries consider conditional probabilities of exit of a state, which once regularized, will lead to the production of "laws of experiment".
These probabilities are generally estimated within a nonparametric framework and the standard framework used by the practitioners is the following:
- estimation "causes by cause" (e.g. in dependence: death of the insured people and entry in dependency state);
- estimate with Hoem or Kaplan-Meier;
- use of the exposure at risk in the phase of validation of the adjustment to compare the numbers of exits observed and modelled.
One endeavours in this presentation to illustrate the limits of this framework and to propose alternatives.
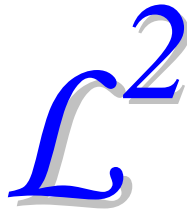
Speaker: Philipp Müller, DSA, Université de Lausanne

Title: « The Impact of pension funding mechanisms on the stability and the payoff from DC pension schemes »

Abstract: The demographic and capital market framework conditions for occupational pension funds have significantly changed over the last decades. A declining ratio of the number of active workers to the number of retirees and historically low returns accompanied with higher volatility pose challenges to pension funds. The aim of this paper is to discuss and evaluate the adequate asset-liability funding ratio for pension funds under consideration of demographic trends and capital market risks from the viewpoints of the different stakeholders. To this regard, the policyholder participation and surplus distribution mechanisms in the case of high funding ratios and supplemental contribution mechanisms in the case of too low funding ratios are of particular relevance. By performing numerical simulations, we examine how the accounts of policyholders evolve over time. We take a simplified balance sheet approach, focus on active insureds, and model a pension fund by simulating the assets and the liabilities of the fund. In the numerical analysis, we study the impact of the various model parameters and derive optimal bounds for the funding ratio for selected types of customers.

Speaker: Stéphane Loisel, ISFA, Université Lyon 1

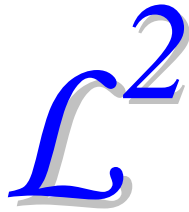Title: « Two years with LoLitA: achievements and challenges »

Abstract: In this talk, we present some results obtained by the research team of the ANR research project LoLitA. We also present some challenges and areas of potential future research collaboration.

Mardi 9 février 2016

Speaker: Maissa Tamraz, DSA, Université de Lausanne

Title: « Collective models for the largest claims of multivariate portfolios »

Abstract: Consider two different portfolios which have claims triggered by the same events. Their corresponding collective model over a fixed time period is given in terms of individual claim sizes (X_i, Y_i), $i \geq 1$ and a claim counting random variable N. In this paper we are concerned with the joint distribution function F of the maximal claims $(X_{N:N}, Y_{N:N})$. We investigate both distributional and asymptotic properties of $(X_{N:N}, Y_{N:N})$. It tuns out that the basic properties of F are greatly influenced by the tail heaviness of N. Under weak assumptions on N we derive an approximation of F and its copula, given that (X_1, Y_1) has a tractable dependence functions. By allowing N to depend on some parameter, say \theta, then F=F(\theta) is for various choices of N a tractable parametric family of bivariate distribution functions. We present five applications of the implied parametric models to some data from the literature and a new data set from a Swiss Insurance Company.

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Speaker: Mabelle Sayah, ISFA, Université Lyon 1

Title: « Analyzing and Comparing Basel's III Sensitivity Based Approach for the interest rate risk in the trading book »

Abstract: A bank's capital charge computation is a widely discussed topic with new approaches emerging continuously. Each bank computes this figure using internal methodologies in order to reflect its capital adequacy; however, a more homogeneous model is recommended by the Basel committee to enable judging the situation of these financial institutions and relating different banks among each other.
In this paper, we compare different numerical and econometric models to the Sensitivity Based Approach (SBA) implemented by the Basel Committee on Banking Supervision (BCBS) under Basel III in its December 2014 (rev. March 2015) publication in order to compute the capital charge in the trading book. We study the influence of having several currencies and maturities within the portfolio and try to define the time horizon and confidence level implied by Basel's III approach through an application on bonds portfolios.
By implementing several approaches, we are able to find equivalent VaRs to the one computed by the SBA on a pre-defined confidence level (97.5 %). However, the time horizon differs according to the chosen methodology and ranges from 1 month up to 1 year.

Speaker: Youssouf Toukourou, DSA, Université de Lausanne

Title: « On bivariate lifetime modelling in life insurance applications »

Abstract: Insurance and annuity products covering several lives require the modelling of the joint distribution of future lifetimes. In the interest of simplifying calculations, it is common in practice to assume that the future lifetimes among a group of people are independent. However, extensive research over the past decades suggests otherwise. In this paper, a copula approach is used to model the dependence between lifetimes within a married couple using data from a large Canadian insurance company. As a novelty, the age difference and the gender of the elder partner are introduced as an argument of the dependence parameter. Maximum likelihood techniques are thus implemented for the parameter estimation. Not only do the results make clear that the correlation decreases with age difference, but also the dependence between the lifetimes is higher when husband is older than wife. A goodness-of-fit procedure is applied in order to assess the validity of the model. Finally, considering several products available on the life insurance market, the paper concludes with practical illustrations.

Speaker: Hanspeter Schmidli, Université de Cologne, Allemagne

Title: « Capital Injections and Dividends with Tax »

Abstract: Consider an insurance surplus process (compound Poisson model or diffusion approximation). The classical measure for the risk is the ruin probability. De Finetti (1957) has introduced dividend payments until ruin and measured the risk by the expected discounted
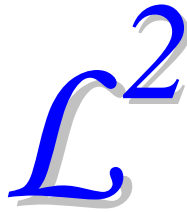
dividend payments. Kulenko and S. (2008) and Scheer and S. (2011) added capital injections. Ruin was not allowed, and the risk is measured as the discounted value of dividends minus penalised capital injections. In this work we add tax payments on the dividend payments. The capital injections lead to tax exemptions up to the same value as the injections. The value of a strategy is the discounted value of the dividends after tax minus the penalised capital injections.

We construct the value function of the problem, both for the classical model and the diffusion approximation. We show that the value function fulfils a Hamilton--Jacobi--Bellman equation. It turns out that the optimal dividend strategy is a two barrier strategy. If an immediate dividend is exempt from tax, the barrier is the same as the barrier in the problem without tax. If there is no exemption left, the barrier is at a higher level than in the case without tax, unless the barrier is at zero.

Speaker: Guillaume Biessy, SCOR Global Life & Laboratoire de Mathématiques et Modélisation d'Évry - Université d'Évry Val d'Essonne, France

Title: « Continuous time semi-Markov inférence of biometric laws associated with a Long-Term Care Insurance portfolio »

Abstract: Unlike the mortality risk on which actuaries have been working for more than a century, the long-term care risk is young and as of today hardly mastered. Semi-Markov processes have been identified as an adequate tool to study this risk. Nevertheless, access to data is limited and the associated literature still scarce. Insurers mainly use discrete time methods directly inspired from the study of mortality in order to build experience tables. Those methods however are not perfectly suited for the study of competing risk situations.
The present paper aims at providing a theoretical framework to estimate biometric laws associated with a long-term care insurance portfolio. The presented method relies on a continuous time semi-Markov model with three states: autonomy, dependency and death. The dependency process is defined using its transition intensities. We provide a formula to infer the mortality of autonomous people from the general population mortality, on which we ought to have more reliable knowledge. We then propose a parametric expression for the remaining intensities of the model. Incidence in dependency is described by a logistic formula. Under the assumption that the dependent population is a mixture of two populations with respect to the category of pathology that caused dependency, we show that the resulting intensity of mortality for dependent people takes a very peculiar form, which is semi-Markov. Estimation of parameters relies on the maximum likelihood method. A parametric approach eliminates issues related to segmentation in age categories, smoothing or extrapolation at higher ages. While creating model uncertainty, it proves very convenient for the practitioner. Finally, we provide an application using data from a real long-term care insurance portfolio.

Speaker: Anani A. Olympio, ISFA, Université Lyon 1

Title et abstract TBA